On the Office of the Heart Wood of Trees. *By* T. A. Knight, *Esq. F.R.S. In a Letter addressed to the Right Hon. Sir* Joseph Banks, *Bart. G.C.B. P.R.S.* Read February 5, 1818. [*Phil. Trans.* 1818, *p.* 137.]

As all trees that afford timber live many years before their alburnum becomes converted into heart wood, it does not seem probable that that substance should execute any important office in the vegetable. Mr. Knight, however, is not disposed to coincide in opinion with some writers, who consider the heart wood as a wholly lifeless substance; and he now thinks that, in common with the alburnum and bark, it becomes a winter reservoir of that organizable matter which the tree expends in its vernal germination; that every species of tree and perennial plant contains within itself during winter all the matter employed in forming its early foliage and shoots; and that it is owing to the presence or absence of such reservoir that the lives of plants become annual, biennial, and perennial. The annual wholly exhausts itself in feeding its flowers and seeds, it forms no reservoir, and therefore perishes. A biennial fills its reservoir in one season, and exhausts it in the following. In the tree, as in the biennial, part of the sap descends in the spring to form roots, and part ascends to produce buds, but it also forms a new layer of bark upon the whole surface of its alburnum.

The alburnum and bark of trees not appearing to Mr. Knight to contain as much organizable matter as appeared thus expended, and observing much soluble matter in the heart wood, he was led to examine the relative quantity of fluid in them. He found that in a vigorous oak, 40 years old, 1000 parts of alburnum gave, in December, 469, and of the heart wood 500. The experiment was repeated upon similar pieces of the same tree in April, and 1000 of alburnum lost 532, and 1000 of heart wood 507. In a poplar 80 years old, 1000 of alburnum in December lost 535, and heart wood 626: in March the loss was 557, and 684. This abundance of fluid in the heart wood was first observed by M. Coulomb, who regarded it as ascending from the earth; and concluded that the sap of trees chiefly passes up near the medulla, through the heart wood. Mr. Knight considers this conclusion erroneous; for when he divided the alburnum of an oak tree in winter, there was no life in the part above the wound in the ensuing spring; and in June the leaves faded rapidly after a similar experiment. These and other considerations induce Mr. Knight to reject the hypotheses which assume the ascent of the sap through the heart wood, and lead him to believe that the fluid which affords the organizable matter required for the annual conversion of alburnum into heart wood is derived from the bark, and that it passes inwards during the latter part of the summer and autumn through the convergent cellular processes, to return in part through the same passages, when a new layer of bark is to be formed in the spring.